Plate Tectonic Cycle

Earth's Moving Force

FOURTH GRADE

WORKBOOK

student _____

PLATE TECTONIC CYCLE - VOLCANOES (4)
PRE LAB

MODEL OF A VOLCANO. CUT, FOLD, AND THEN PASTE THE MODEL TOGETHER. WHAT TYPE OF VOLCANO DO YOU HAVE?

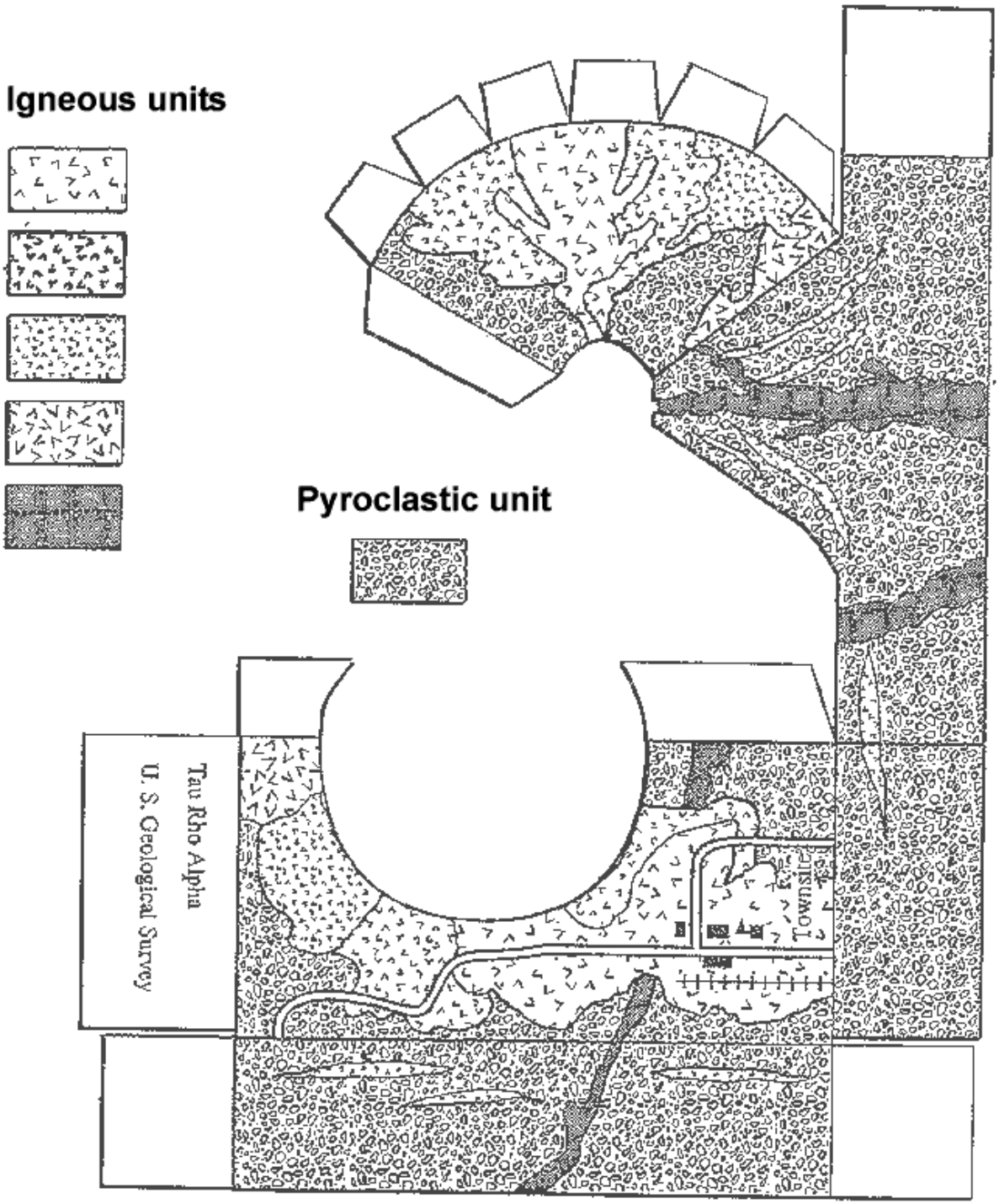
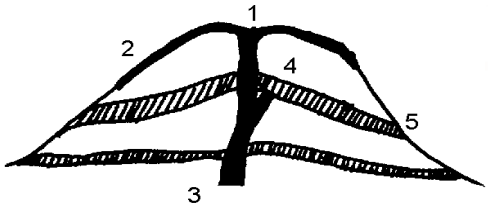


PLATE TECTONIC CYCLE - VOLCANOES (4)
LAB

PROBLEM: How can you make a model volcano that is an ANALOG of a real volcano?

PREDICTION: _____
EXERCISE:
Using the clay provided, build the model volcano assigned by your teacher. Use the diagrams below to help you create a cross section of a volcano. Use different colors to represent ash, lava, and mud.

COMPOSITE VOLCANO

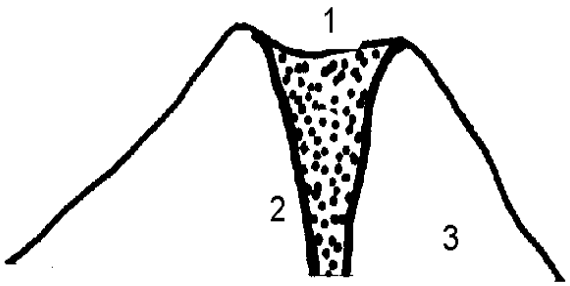


1. CRATER
2. NEW LAVA FLOW
3. CINDER BEDS
4. OLDER LAVA FLOW
5. ASH BEDS

1. What makes this model different from a cinder and a shield volcano? _____
_____

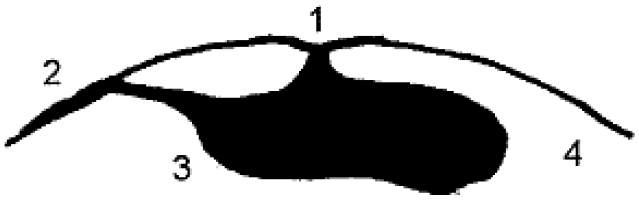
CINDER CONE

1. CRATER
2. VENT
3. CINDER BEDS



2. What makes this model different from a composite and a shield volcano? _____

_____
_____
_____



SHIELD VOLCANO

1. SUMMIT
2. NEW LAVA FLOW

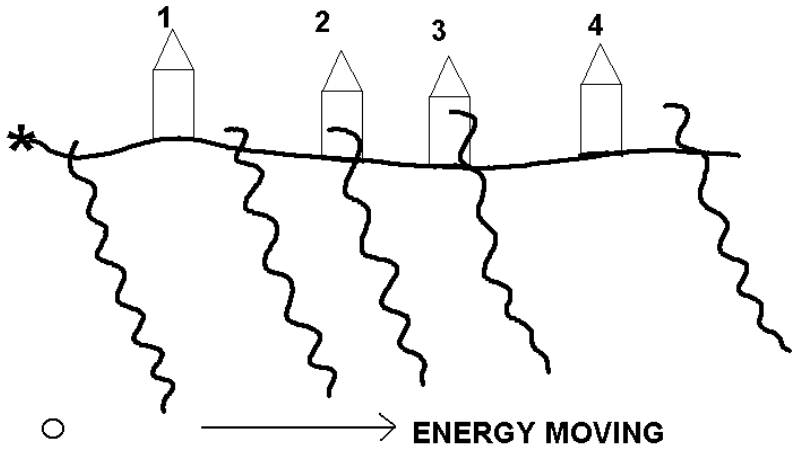
3. MAGMA
4. OLD LAVA FLOWS

3. What makes this model different from a cinder and a composite volcano?
_____
_____

CONCLUSION: How can you make a model volcano that correctly mirrors a real volcano?_____
_____

PLATE TECTONIC CYCLE - EARTHQUAKES (4)
PRE LAB

LABEL THE FOCUS AND EPICENTER.



1. Which homes will feel the most intensity? _____

2. Why? _____

3. Which house feels the intensity the least? Why? _____
_____
_____

4. The following picture is an enlarged view of three different types of soil. Which one do you think would "resist" shaking the most? Why?
_____
_____

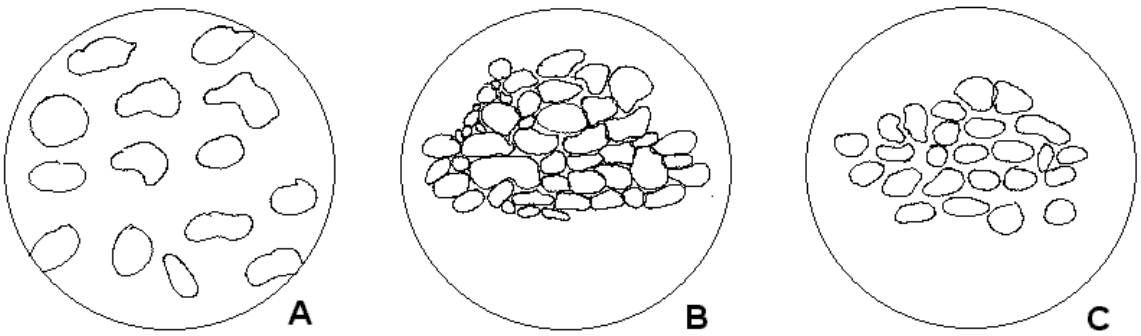


PLATE TECTONIC CYCLE - EARTHQUAKES (4)
LAB

PROBLEM: What happens to buildings on the Earth's surface during an earthquake?

PREDICTION:_____

PROCEDURE: You will conduct two experiments to study how different structures withstand simulated earthquake waves. Follow the directions given for each exercises below.

EXERCISE I. MATERIALS: different building block shapes, shaker boards, marbles, plastic container lids, toy blocks or building set

1. Construct a shaker table according to your teacher's directions.
2. Each person in your group will shake the table a different way. Write the last name of the person who shakes the board in front of each intensity. Practice each shake 5 times before you do the experiment.

_____ A. slow-long board (low intensity)
_____ B. quick-long board (high intensity)
_____ C. slow-side board (low intensity)
_____ D. quick-side board (high intensity)

3. Using the blocks or toys, build for differently shaped buildings on the table, one at a time. By shaking the table, determine how each shape resists each of the shaking motions. Use the following code:

R = resistant (falls down after 10 seconds or more)
S = semi resistant (falls down after 3-10 seconds)
N = not resistant (falls down quickly)

DRAW SHAPE	A	B	C	D

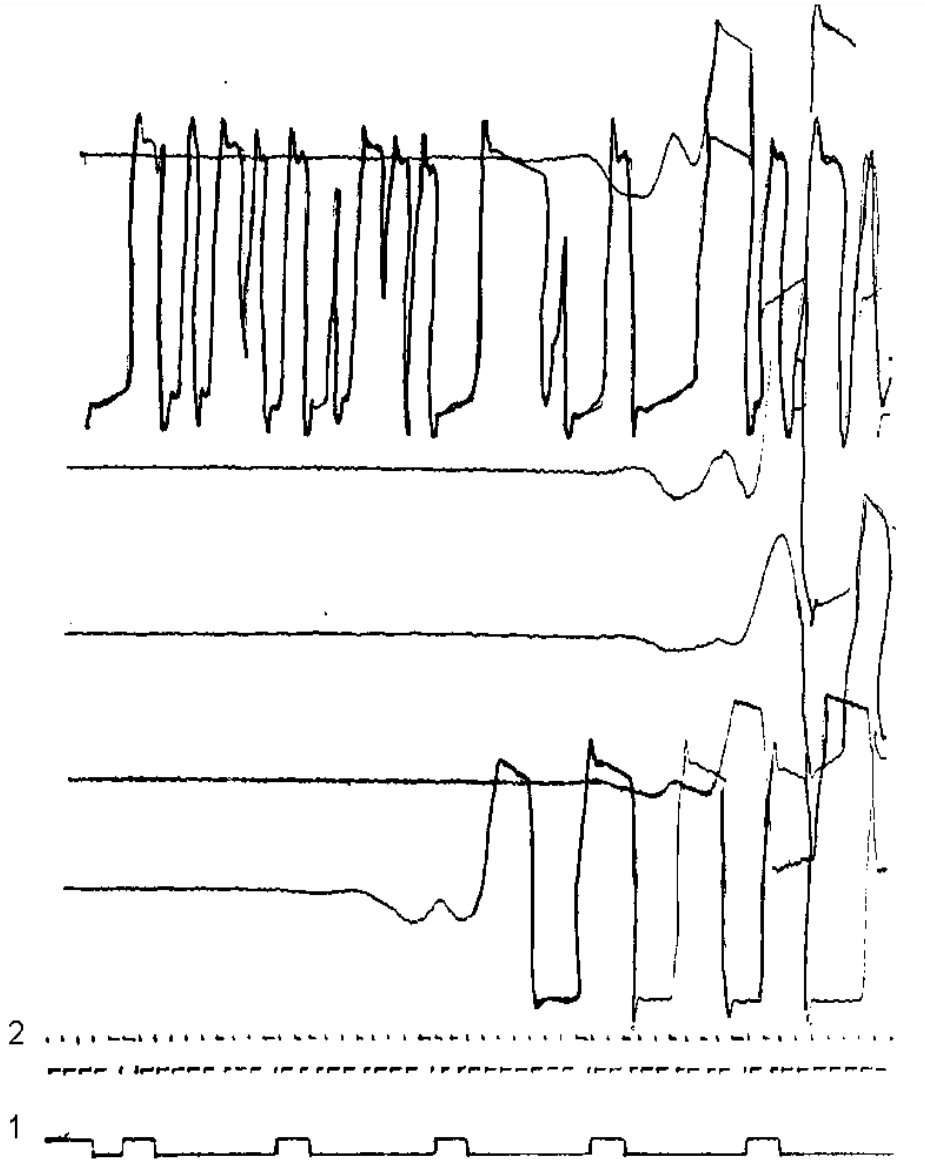
EXERCISE II. Arrange 3 styrofoam cups on the table in an arrangement that will withstand Shaking Intensity A. Draw your arrangement below. The cups may be placed up or down.

CONCLUSION: Which shapes and structures are most resistant to different intensities of earthquakes?_____

PLATE TECTONIC CYCLE - EARTHQUAKES (4)
POST LAB

1. How many seismograph stations are shown?

_____



These seismograms show an approximately a 3.0 magnitude (Richter Scale) earthquake near Mammoth Lakes, California

2. Place a P where the primary wave starts at each station.
   Place an S where the secondary wave starts at each station.

3. What do the lines labeled 1 and 2 represent? _____

_____

PLATE TECTONIC CYCLE - PLATE TECTONICS (4)
PRE LAB

LABEL: CRUST, MANTLE, OUTER CORE, INNER CORE

What is the thickness of the:

CRUST _____mm X 82 km = _____km
MANTLE _____mm X 82 km = _____km
OUTER CORE _____mm X 82 km = _____km
INNER CORE _____mm X 82 km = _____km

TOTAL THICKNESS OF THE EARTH = _____km

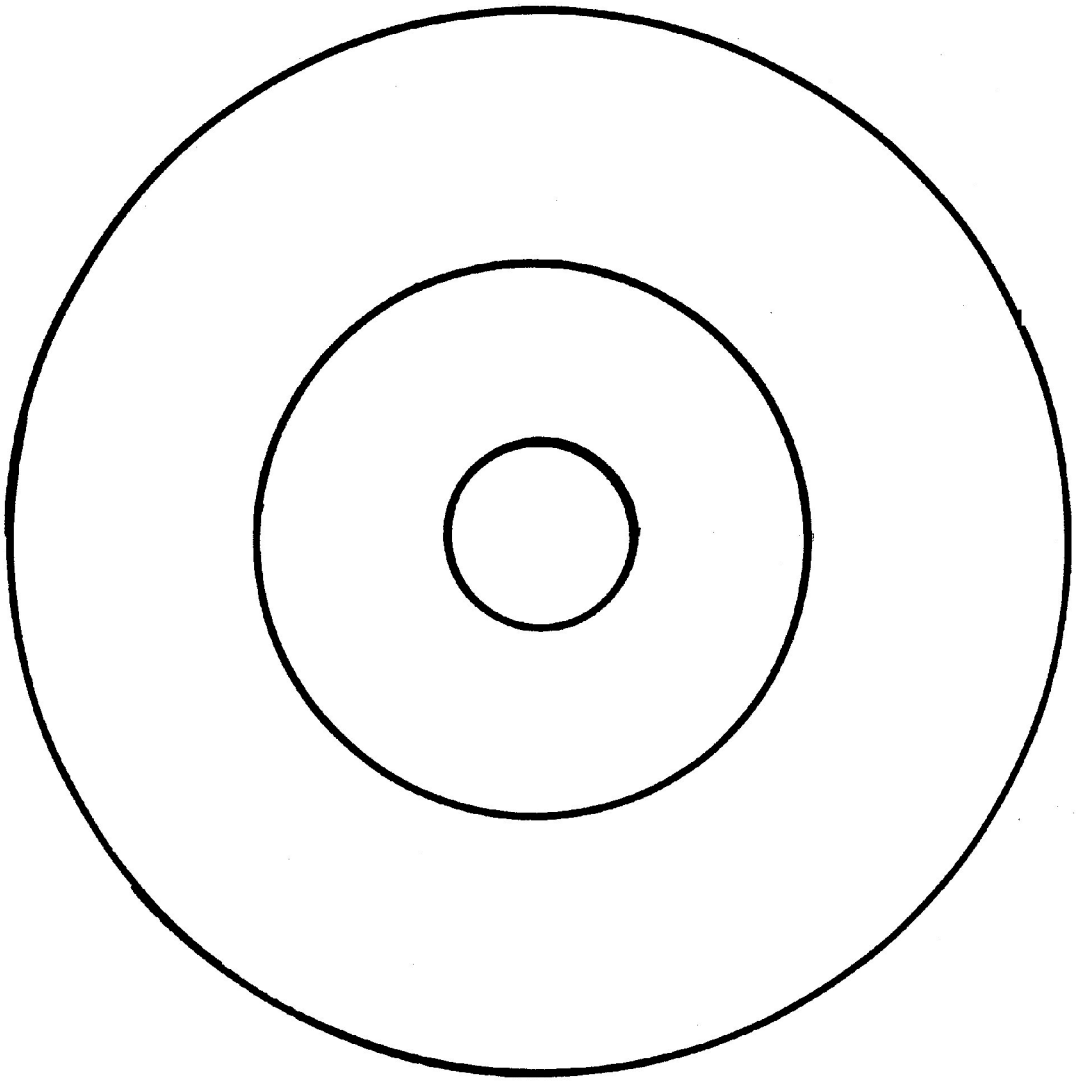


PLATE TECTONIC CYCLE - PLATE TECTONICS (4)
LAB

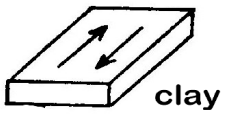
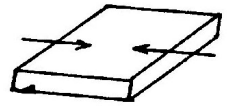
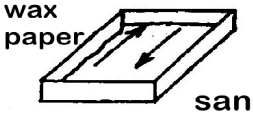
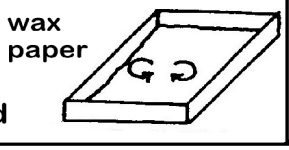
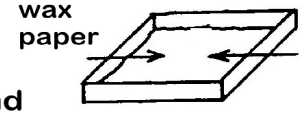
PROBLEM: When the crust of the Earth moves what does it create?

PREDICTION: _____
_____

EXERCISE I. Draw the inside of the Earth. Label the crust, mantle, inner core, outer core.

EXERCISE II. Using either a piece of clay or wax paper and sand, try to recreate the three types of pressure that occur in the plates. Try to imagine if earthquakes or volcanoes would occur in each. Do the experiment **slowly.** Describe what happens in the space

MATERIALS: box, slab of clay, sand, wax paper

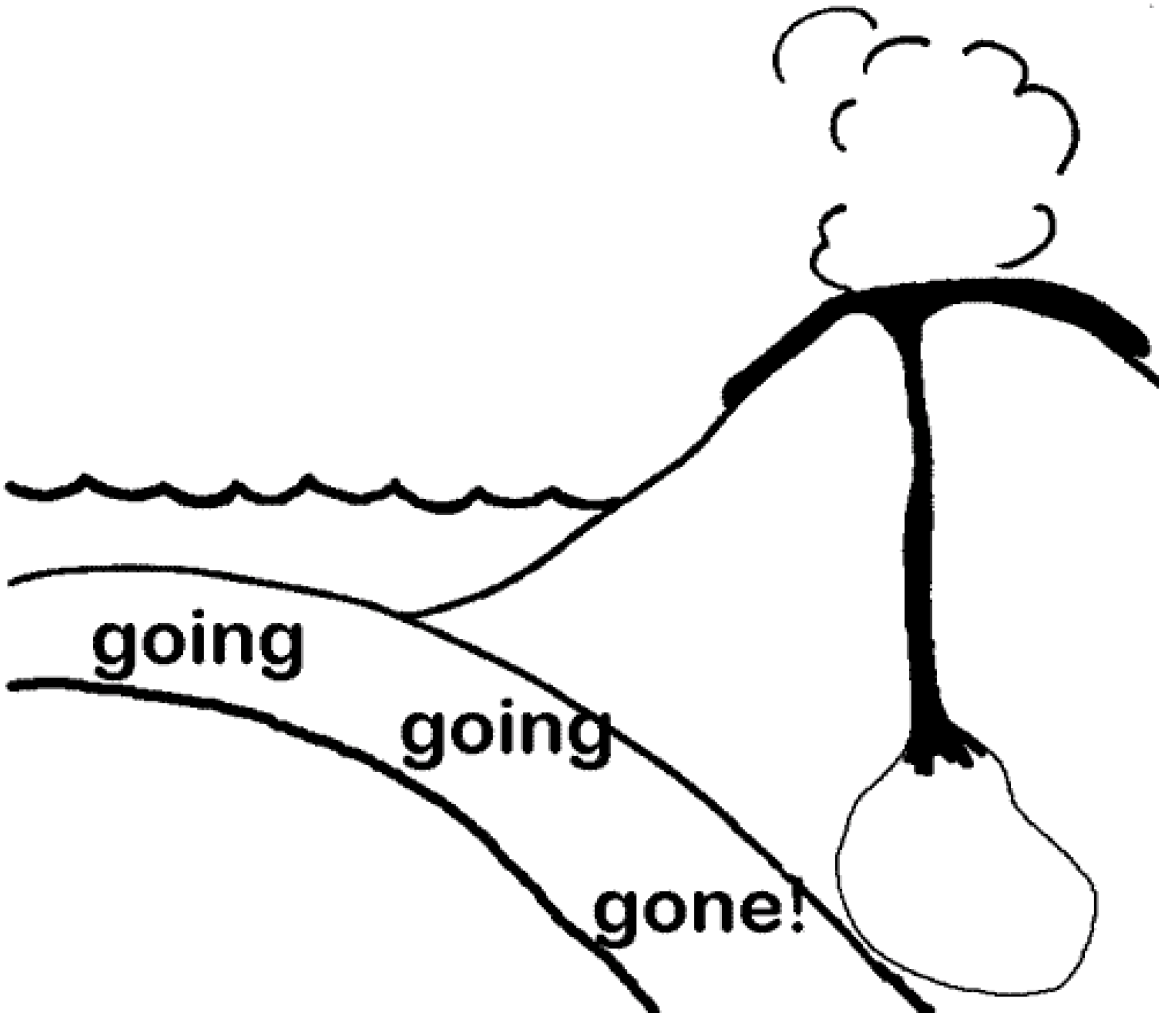
A	B	C
	do not use clay	
		

TRANSFORM	DIVERGING	CONVERGING

CONCLUSION:
Which situations create volcanoes? _____
Which situations create earthquakes? _____
Which situation creates both earthquakes and volcanoes?
_____
_____
_____

PLATE TECTONIC CYCLE - PLATE TECTONICS (4)
POST LAB

WHERE CAN YOU LOCATE MELTED ROCK?



LABEL THIS AREA AS "MELT" ON YOU DIAGRAM.

LABEL THE AREA WHERE EARTHQUAKES
CAN OCCUR WITH AN "X."

HOW CAN A VOLCANO BE CREATED?

_____
_____
_____
_____
_____
_____

PLATE TECTONIC CYCLE - HAZARDS (4)
LAB

PROBLEM: Can buildings be constructed to withstand earthquakes?

PREDICTION: _____

EXERCISE I. Examine the slides of the disasters caused during the following earthquakes. Record what happened and the intensities of each earthquake.

	LOCATION	MAGNITUDE	DESCRIBE DAMAGE
1.	Anchorage, Alaska		
2.	Los Angeles, Calif.		
3.	Mexico City, Mexico		
4.	Nigata, Japan		
5.	Peru		

EXERCISE II. You previously did an exercise on different earthquake intensities. Let's use the same directions you used in the previous exercise to see what will cause harm in different situations. Each table will have different "real life" models to place within the different types of structures. Create a situation where people can be found outside and inside. Shake the table and see what happens. After testing the models we will talk about the different disasters.

TYPE OF BUILDING MATERIAL:_____

	DESCRIBE STRUCTURAL DAMAGE
A. slow-long board (low intensity)	
B. quick-long board (high intensity)	
C. slow-side board (low intensity)	
D. quick-side board (high intensity)	

CONCLUSION: How can you design your structure to withstand a moderate earthquake?

_____

_____

PLATE TECTONIC CYCLE - HAZARDS (4)
POST LAB

DIRECTIONS: Determine the Modified Mercalli Scale intensity and Richter magnitude of each of described earthquakes. Use the tables on the next page to guide your answers.

1. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing cars may rock slightly. The vibration feels similar to the passing of a truck.

MERCALLI_____ RICHTER_____

2. Damage is negligible in buildings of good design and construction: slight to moderate in well-built ordinary structures; considerable damage in poorly build or badly designed structures; some chimneys broken.

MERCALLI_____ RICHTER_____

3. Not felt except by a very few under especially favorable conditions.

MERCALLI_____ RICHTER_____

4. Felt by all, many frightened. Some heavy furniture is moved; a few instances or fallen plaster. Damage slight.

MERCALLI_____ RICHTER_____

5. Damage slight in specially designed structures; considerable damage in ordinary substantial building with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

MERCALLI_____ RICHTER_____

6. Define the Mercalli Intensity Scale:

_____

_____

7. Define the Richter Magnitude Scale:

_____

_____

Scale of Earthquake Intensities with Approximately Corresponding Magnitudes

MERCALLI INTENSITY	DESCRIPTION	RICHTER MAGNITUDE
I.	*INSTRUMENTAL*: detected only by seismographs	**3.5**
II.	*FEEBLE*: noticed only by sensitive people	**4.2**
III.	*SLIGHT*: like the vibrations due to a passing train; felt by people at rest, especially on upper floors	**4.3**
IV.	*MODERATE*: felt by people while walking; rocking of loose objects, including standing houses	**4.8**
V.	*RATHER STRONG*: felt generally; most sleepers are awakened and bells ring	**4.9 - 5.4**
VI.	*STRONG*: trees sway and all suspended objects swing; damage by overturning and falling of loose objects	**5.5 - 6.0**
VII.	*VERY STRONG*: general alarm; walls crack; plaster falls	**6.1**
VIII.	*DESTRUCTIVE*: car drivers seriously disturbed; masonry fissured; chimneys fall; poorly constructed buildings damaged	**6.2**
IX	*RUINOUS*: some houses collapse where ground begins to crack, and pipes break open	**6.9**
X	*DISASTROUS*: ground cracks badly; many buildings destroyed and railway lines bent; landslides on steep slopes	**7.0 - 7.3**
XI	*VERY DISASTROUS*: few buildings remain standing; bridges destroyed; all services (railways, pipes and cables) out of action; great landslides and floods	**7.4 - 8.1**
XII	*CATASTROPHIC*: total destruction; objects thrown into air; ground rises and falls in waves	**> 8.1**